**REMARKS**

This is in response to the final Office Action dated September 10, 2007. Reconsideration is respectfully requested.

Request for Extension of Time

Applicant hereby requests that the time period for response be extended three months, from December 10, 2007 to March 10, 2008. Applicant authorizes payment by credit card of the extension fee of $525 pursuant to 37 CFR 1.17(a)(3) with this filing.

Request for Continued Examination

Applicant hereby submits a Request for Continued Examination pursuant to 37 CFR 1.114. Applicant authorizes payment by credit card of the fee of $405 pursuant to 37 CFR 1.17(e) with this filing.

Support for Claim Amendments

Applicant has added Claim 34, which combines the subject matter of Claims 1 and 3. No new matter has been added.

Summary of Interview

Applicant thanks the Examiner and her supervisor for the interview conducted on January 30, 2008. U.S. Patent No. 6,106,968 to Johnson et al was discussed along with Claims 1 and 3. Applicant exhibited a VRLA battery and exemplary electrolyte level sensors. Applicant presented arguments traversing the claim rejections on the basis of Johnson et al, contending that the electrolyte in VRLA batteries disclosed in Johnson et al is immobilized in a medium, such as a gelatin or a porous mat, and therefore, there is no electrolyte level to be sensed as recited in applicant's claims. Applicant further asserted that Johnson et al does not teach or suggest an electrolyte level sensor, is not a relevant reference and

cannot support a rejection of applicant's claims on the basis of either anticipation or obviousness.

Status of the Claims

Claims 1-8, 11-14, 32 and 33 are pending and all are rejected. Claims 1-3, 6-8, 32 and 33 are rejected as anticipated by U.S. Patent No. 6,106,968 to Johnson et al. Claims 4 and 5 are rejected as obvious over Johnson et al, and Claims 11-14 are rejected as obvious over Johnson et al in view of U.S. Patent No. 4,283,467 to Gutlich et al.

The Traversal

Applicant respectfully traverses the rejections, contending that the cited references fail to meet the criterion necessary for anticipation, and fail to meet the requirements necessary to establish a *prima facie* case of obviousness. Arguments traversing the rejections are presented below.

Claim 1

Claim 1 is drawn to a lead-acid battery having cells holding a liquid electrolyte, the electrolyte having a free surface indicative of the level of the electrolyte in each of the cells. Claim 1 recites, in relevant part, "an electrolyte level sensor attached to at least one of said cells for sensing the location of said free surface within said at least one cell, said level sensor capable of generating an electronic signal indicative of an amount of electrolyte in at least one of said cells based upon the location of said free surface within said at least one cell". Applicant contends that Johnson et al does not teach or suggest a battery having an electrolyte having a free surface or a level sensor for sensing the location of the free surface as recited in Claim 1. Therefore, Johnson et al fails to meet the criterion necessary for anticipation because every claim element is not taught in this reference.

Applicant observes that Johnson et al discloses, at column 4, beginning at line 22, sensors which measure battery temperature, the state of various valves and the temperature and pressure in a gas release compartment. Column 4, beginning at line 53, discloses further sensors which sense the voltage, temperature and internal resistance of the battery. Nowhere, however, is a free surface of an electrolyte shown or described. Nowhere is an electrolyte level sensor described or shown in the drawings. This is not surprising, since there is no electrolyte level within a valve regulated lead acid (VRLA) battery as described in Johnson et al.

The Examiner admits, on page 2 of the Action, that Johnson et al teaches a VRLA battery. As is well known in the battery arts, the electrolyte in a VRLA battery is immobilized in a medium positioned between the battery plates. The medium may comprise, for example, a gelatin or an absorbent glass fiber mat. This arrangement eliminates the possibility of spills or leakage of electrolyte from the battery. Furthermore, there are void spaces in the medium which carries the electrolyte to facilitate the oxygen recombination cycle upon which the VRLA battery operates. The void spaces are provided, for example, by cracks or fissures in the gelatin to allow oxygen transport from the positive to the negative plates. When an absorbent mat is used, the mat is not completely saturated with electrolyte, but 5% to 10% void space is maintained to permit oxygen transport.

A description of a VRLA battery may be found in the learned treatise entitled Maintenance-Free Batteries, Second Edition, by D. Berndt, published by John Wiley & Sons, 1997. Page 3 of this treatise defines a VRLA battery as one wherein the electrolyte is immobilized to achieve the internal oxygen cycle. Pages 341-343 of this treatise describe particular

VRLA battery embodiments which employ either the absorbent glass mat or the gelatinous medium to immobilize the electrolyte. These selected pages are provided herewith, attached as Exhibit A.

Consistent with the aforementioned characteristics of the VRLA battery, the invention disclosed in Johnson et al is concerned with indirectly inferring the amount of electrolyte in a VRLA battery by measuring parameters, such as temperature, pressure, voltage and current, and using a known mathematical relation between such parameters to infer how much electrolyte remains in the VRLA battery. By way of example, applicant directs the Examiner's attention to column 5, beginning at line 55, wherein temperature and pressure measurements, taken in the gas release compartment of the VRLA battery, are used in conjunction with the ideal gas law to approximate how much electrolyte has been lost from the battery. The use of such indirect methods for inferring the amount of electrolyte in a VRLA battery is necessary because there is no electrolyte level in a VRLA battery which can be sensed.

In support of her position, the Examiner cites Johnson et al at column 2, lines 39-40, which state:

> "Alternatively, the fluid level or weight of the VRLA battery may be measured."

For anticipation, the reference is required to teach every claim element. The statement cited by the Examiner does not teach any claim elements. Claim 1 recites a level sensor. As noted above, there is no level sensor taught or suggested anywhere in Johnson et al. Claim 1 also recites an electrolyte having a free surface. Johnson et al does not teach a battery having an electrolyte with a free surface. The lines quoted by the Examiner from the reference have no bearing on the rejection of Claim 1 because they do not teach

or suggest any elements recited in Claim 1. The mere presence of a statement that "a fluid level may be measured" in the absence of a teaching of specific claim elements, such as a sensible fluid level, or sensors which can measure such a level, cannot rationally justify a rejection on the basis of anticipation.

Applicant requests that the Examiner show where Johnson et al teaches "a level sensor capable of generating an electronic signal indicative of an amount of electrolyte in at least one of said cells based upon the location of said free surface" as recited in Claim 1. Applicant requests that the Examiner show where Johnson et al teaches a battery having a "liquid electrolyte having a free surface indicative of the level of said liquid electrolyte in each of said cells" as recited in Claim 1. In the absence of an unambiguous showing of such elements, applicant contends that Johnson et al does not meet the requirements necessary for anticipation and requests that the rejection of Claim 1 be withdrawn.

Claims 2, 3 and 6-8 depend, either directly or indirectly, on Claim 1 and should be allowable for the same reasons that Claim 1 is allowable. Furthermore, Claim 3 recites cell valves in each cell which comprise a valve member responsive to a level of water in each cell to effect opening and closing of the cell valve. Applicant contends that such cell valves are not taught or suggested in Johnson et al which, therefore, cannot anticipate Claim 3. Applicant notes that the Examiner has not directly addressed Claim 3, and requests that it be specifically shown where such a valve is taught or suggested in Johnson et al. In the absence of such a showing, applicant requests that the rejection be withdrawn.

Claim 6 further recites a latch biased by a biasing member which holds a coupling in engagement with a fitting. This is a very detailed claim which expressly describes a

particular mechanism. The Examiner rejects Claim 6 with the statement, "a valve is considered to be a biasing member that is electrically actuatable". This statement does not address the elements of the claim and cannot possibly form the basis of an argument supporting an anticipation rejection. To anticipate a claim, the reference must teach every claim element. To anticipate Claim 6, the reference must teach a latch. The Examiner has failed to show where in Johnson et al a latch is taught. The reference must teach a biasing member biasing the latch. The Examiner has failed to show where in Johnson et al a biasing member for a latch is taught. Is it possible that "a valve is considered to be a biasing member that is electrically actuatable" is sufficient to support a rejection of the latch and biasing member for the latch as recited in Claim 6? There can be no rational disagreement that the Examiner's rejection does not meet the minimum requirements for anticipation and the rejection should be withdrawn.

Claim 32

Claim 32 is drawn to a method of replenishing water to cells of a lead-acid battery and recites, in relevant part:

> "providing a plurality of cell valves, one of said cell valves being positioned in each of said cells for controlling water flow from said water conduit to each of said cells, each of said cell valves comprising a valve member responsive to a level of water in each said cell to effect opening of said cell valve when said amount of water is less than a first predetermined amount, and closing of said cell valve when said amount of water is greater than a second predetermined amount" and
>
> "halting flow of said water to each of said cells using said valve members responsive to said level of water in each said cell by closing of said cell valves when said amount of water in each said cell is

greater than said second predetermined amount."

Applicant contends that such cell valves are neither taught nor suggested in Johnson et al, nor is the step of halting flow of water using valve members responsive to a level of water in each battery cell. Applicant requests that the Examiner point out specifically where in Johnson et al such cells are taught, or withdraw the rejection because it is not properly supported by the reference.

<u>Claims 4 and 5</u>

Claims 4 and 5 are rejected as obvious over Johnson et al. One of the criteria necessary to establish a *prima facie* case of obviousness requires that the reference teach or suggest all claim limitations. Claims 4 and 5 depend indirectly upon Claim 1 and, therefore, incorporate all of the recitations of that claim. The rejections are based upon the assumption that Johnson et al teaches or suggests all of the limitations of Claim 1 in addition to those recited in Claims 4 and 5. However, it was shown above that Johnson et al does not teach all limitations of Claim 1. Logically, therefore, Johnson et al also does not teach all limitations of Claims 4 and 5. Applicant contends that Claims 4 and 5 should be allowable over Johnson et al for the same reasons that Claim 1 is allowable, i.e., all claim limitations are not taught or suggested.

<u>Claims 11-14</u>

Claims 11-14 are rejected as obvious over Johnson et al in view of Gutlich et al. However, one of the criteria necessary to establish a *prima facie* case of obviousness requires that the reference, or references when combined, teach or suggest all claim limitations. Claims 11-14 depend, either directly or indirectly, upon Claim 1 and, therefore, incorporate all of the recitations of that claim. The rejections of these claims are based upon the assumption that

Johnson et al teaches or suggests all of the limitations of Claim 1 in addition to those recited in Claims 11-14. However, it was shown above that Johnson et al does not teach all limitations of Claim 1. Logically, therefore, Johnson et al also does not teach all limitations of Claims 11-14. Applicant contends that Claims 11-14 should be allowable over Johnson et al for the same reasons that Claim 1 is allowable, i.e., all claim limitations are not taught or suggested.

Summary

Applicant has shown, in the arguments presented above, that the claims are neither anticipated by nor obvious in view of Johnson et al or any reference cited in conjunction with Johnson et al because the cited reference fails to teach or suggest all claim elements. Applicants contend that the claims are allowable and request that the rejections be withdrawn and the application passed to issue.

Respectfully submitted,

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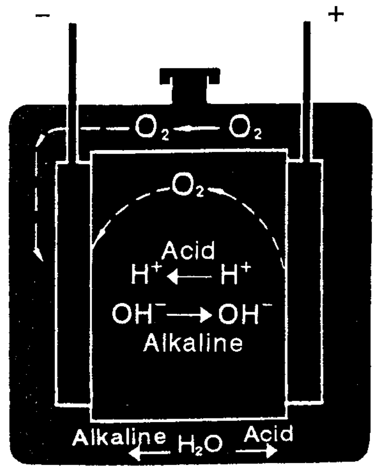
EXHIBIT A

Appln. No. 10/694,276




# Maintenance-Free Batteries

Lead-Acid, Nickel/Cadmium, Nickel/Metal Hydride

A HANDBOOK OF BATTERY TECHNOLOGY
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### 1.1.2 Valve-Regulated Lead-Acid Batteries

In the lead-acid battery, complete sealing can never be achieved because the generation of hydrogen can never be avoided completely, according to fundamental electrochemical parameters. The valve has to open periodically to let small amounts of gas, mainly hydrogen, escape from the cell. Otherwise the internal pressure would exceed technically tolerable limits. Gradual water loss is connected with this gas evolution, and this water loss causes slight changes in the cell parameters during service life. But the rate of water loss can be kept so low that the initial amount of electrolyte is sufficient for a service life of ten years or more.

The **'maintenance-free starter battery'** is beyond the scope of this book, when it is a flooded lead-acid battery, with special constructional features designed to outlast the usual service life in a motor car without refilling. The principles of this battery type are described briefly in Section 7.5.1.1.

#### 1.1.2.1 The Name 'Valve-Regulated Lead-Acid Battery'

Different names are in use for this kind of lead-acid battery. An earlier proposal has been 'sealed valve-regulated lead-acid battery' ([1]), but the term 'sealed' is redundant in this connection, because a valve can operate only when the battery itself is sealed. The term now mostly accepted is **'valve-regulated lead-acid battery'** ([2]) or its abbreviation **VRLA battery**. This name describes quite well the special feature of this design, namely:

- The interior of the valve-regulated lead-acid battery does not have a continuous connection with the surrounding atmosphere to exchange gases, as is characteristic of the vented lead-acid battery.
- The valve-regulated lead-acid battery cannot be sealed completely but has to be equipped with a valve that opens even in normal operation conditions from time to time for gas escape. This is basically different from 'sealed' batteries.

In the literature, however, a number of different names are used instead of 'valve-regulated lead-acid battery'. One reason may be that marketing people want to emphasise the advantages of this battery design by the name. The term 'sealed lead-acid battery' or 'sealed maintenance-free lead-acid battery' is often used, although neither name is correct, as already mentioned. 'Recombinant lead-acid battery ' is rather common, but this name does not point out that this battery cannot be sealed, as is possible with the 'recombinant nickel/cadmium battery'. Sometimes the name 'maintenance-free lead-acid battery" is applied. However, this name is already used for the above mentioned vented starter batteries that do not require water refilling during their service life in the special operating conditions in a motor car. A further version of the name is 'starved-electrolyte lead-acid battery', which indicates that the electrolyte has to be immobilised to achieve the internal oxygen cycle. But 'starved electrolyte' could as well mean a flooded battery with extremely reduced acid content.

On the whole, 'valve-regulated lead-acid battery' seems to be the most appropriate name to express the special features of the lead-acid battery under consideration. This term will be used in this book.

### 10.8.1 Portable Batteries

At first, the valve-regulated lead-acid battery was developed to compete with the sealed nickel/cadmium battery, mainly for economic reasons ([76]), and in the field of small batteries this competition still exists to some extent. Initially, these batteries were mainly used in portable devices like tape recorders or tools, but also stationary applications, like small types of emergency lighting equipment, were soon supplied by such batteries. Later, larger and larger types were developed.

Fig. 10.21 shows examples of valve-regulated lead-acid block batteries. The larger types are not portable in the literal sense. They are used in stationary and traction applications. Corresponding batteries are also offered as single cells, but the block design is often preferred, because most of the applications require a voltage of more than 2 V. Fig. 10.21 demonstrates the great number of different types offered by a single manufacturer.

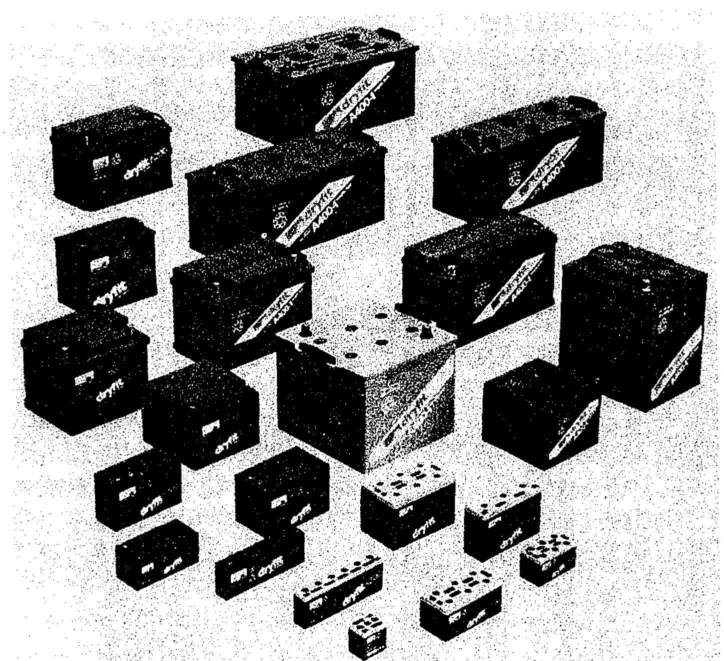

**Fig. 10.21** Valve-regulated lead-acid batteries with gelled electrolyte as block batteries. Blocks with 3 and 6 cells (6 and 12 V resp.). Capacity range: 1 to 130 Ah. SONNENSCHEIN ([77]). (cf. also ([78]).)

The constructional details of such block batteries are demonstrated in Figs. 10.22 and 10.23. Both batteries are equipped with microporous glass-mat separators (absorbent type). A corresponding battery with gelled electrolyte has the same basic constructional features, but instead of the glass mat a conventional microporous separator is inserted to space the electrodes (cf., e.g., Fig. 10.31, p.350).

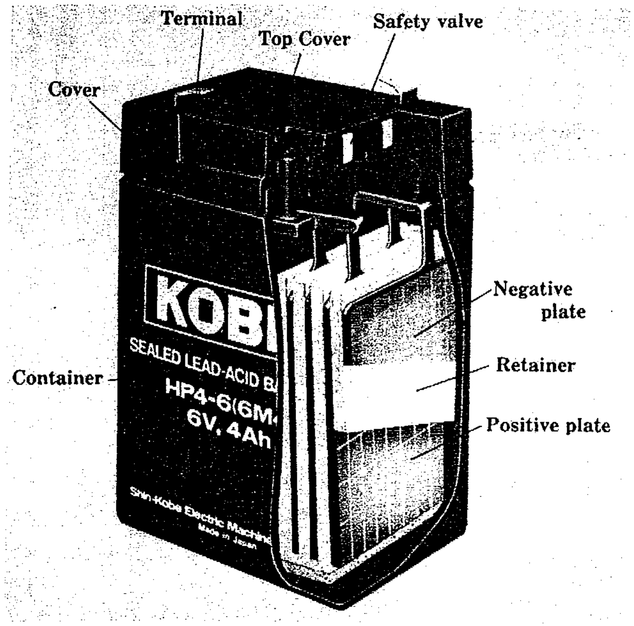


**Fig. 10.22** 6 volt block battery (absorbent glass-mat type). SHIN KOBE ([79]).

The plate groups in the cutaway cells of both Figures have the same essential components as the plate group in Fig. 10.10. They are arranged in different ways in both batteries: three cells side by side in Fig. 10.22; two lines of three cells each in the 12 V version shown in Fig. 10.23.

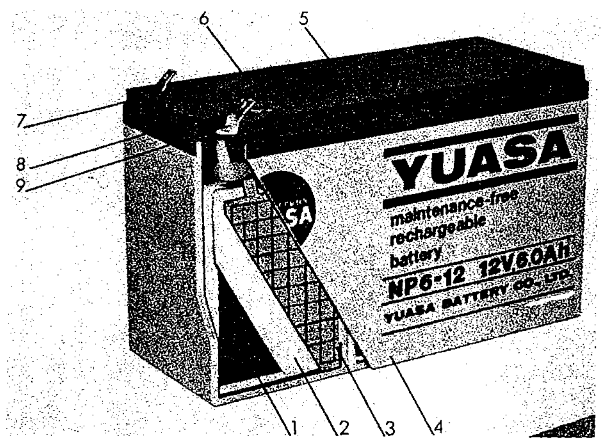


**Fig. 10.23** 12 volt block battery (absorbent glass-mat type).

| | | |
|---|---|---|
| 1: Positive plate. | 2: Microporous glass mat. | 3: Negative plate. |
| 4: ABS container. | 5: Cover of the valve. | 6: Valve. |
| 7: Terminal seal. | 8: ABS battery cover . | 9: Terminal. |

YUASA Battery Co., Ltd. ([80]).

In the cutaway of Fig. 10.22, above the plate group, the pole bridges can be seen welded to the (fairly long) plate lugs. The connection between the individual cells within the bloc is welded as an 'up and over design' shown in Fig. 10.11, p.326. The seal of the valve is a rubber ring that closes the opening.

The batteries in Figs. 10.22 and 10.23 are equipped with individual valves for each cell. Opening pressures of the valves are between 10,000 and 80,000 Pa (100 and 800 mbar or 1.5 and 12 p.s.i. resp.).

A different design principle that is used for batteries in the capacity range between 2.5 and 25 Ah, is shown in Fig. 10.24: on the left, a cross section of a monocell battery; on the right a 12 V 'block' composed of six of these cells. Each cell contains one positive and one negative electrode, which are separated by an absorbent glass-mat separator and spirally wound to form the cell element. Details of this design are to be seen in the foreground on the right of Fig. 10.24. Similar monocells were developed earlier using expanded lead as grid material for both electrodes ([81]).

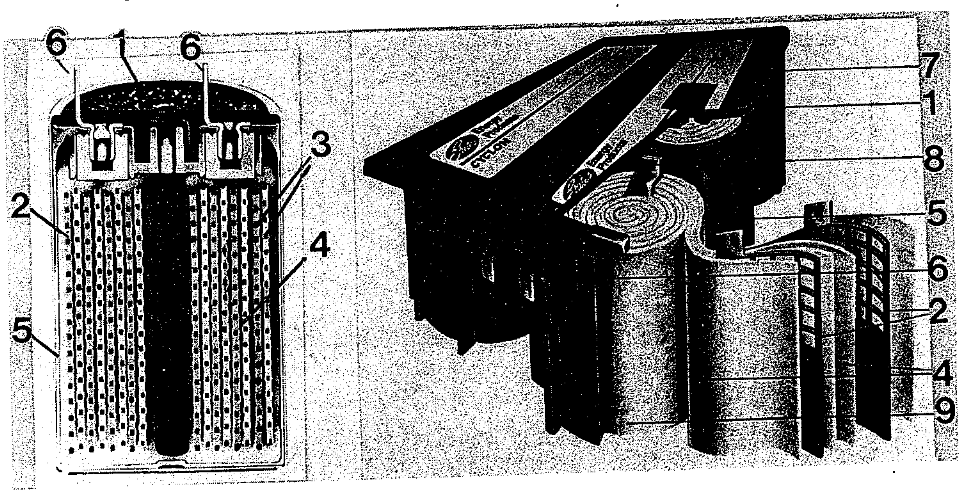


**Fig. 10.24** Batteries with spirally wound electrodes.
Left: Monocell; right: 12 volt block.
**1**: Valve (cf. Fig. 10.13, p.331). **2**: Grid, punched from lead.
**3**: Positive and negative electrodes. **4**: Glass-mat separator.
**5**: Polypropylene container (as a monocell encased by a metallic housing).
**6**: Terminal (bobbin contacts or thread (for 25 Ah only)).
**7**: Monoblock cover. **8**: Intercell connector.
**9**: Spirally wound element of the two electrodes and the separator (4 layers).
(Gates Energy Products ([82]), now HAWKER Energy Products Inc.)

The cross section on the left of Fig. 10.24 shows the version as a cylindrical monocell. The grid is punched from a lead sheet (no alloying additives, except a little amount of tin), soft enough to be wound as in the cutaway cell of the block battery. The cross section shows that the grid is surrounded by the active material as in Fig. 10.6.